

INTRODUCTION

Fences are ubiquitous across the landscape, especially along roadways. Fences serve as safety measures that protect humans and private property from vehicular collisions by containing livestock in pastures, and off roadways. Fences also pose both indirect (i.e., access to habitat, energetic costs) and direct (i.e., mortality) consequences to many species of wildlife with little understanding of their overall effects on the movement and large-scale habitat connectivity of wildlife.

Here, we present results from our first study objective, which was to test multiple wildlife friendly fence modifications in use today that may allow for daily and seasonal wildlife movements, while also keeping livestock in desired pastures. The results and discussion of our second objective, to test the influence of fence density adjacent to roadways on species movement and connectivity, using MDT maintenance road mortality data throughout the Hi-Line region of Montana, are also provided in the project's final report.

OBJECTIVE 1: TESTING FENCE MODIFICATIONS

METHODS: Using remote cameras, a Before-After-Control-Impact (BACI) experimental design was used to 1) test the effectiveness of three fence modifications that are currently used by MDT (PVC-pipe 'goat bars', carabiners, and a smooth wire) in conjunction with barbed-wire right of way fences for pronghorn movements (Fig. 1); and 2) test the effectiveness of PVC-pipes and sage-grouse markers placed on the top wire of barbed-wire fences for pronghorn, mule deer and white-tailed deer movements (Fig. 2). Remote cameras captured the wildlife and livestock fence interactions; which were processed using a standardized approach. This research was conducted in southeastern Alberta, Canada and northcentral Montana, USA.

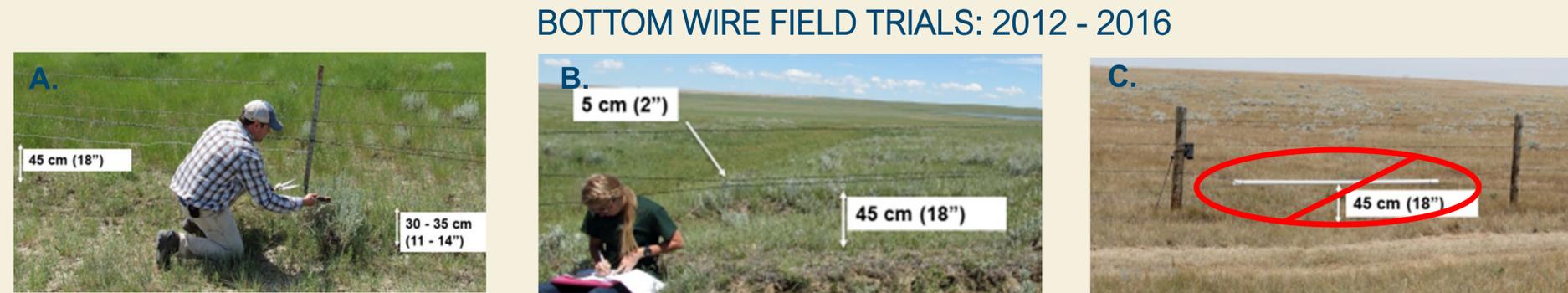


FIGURE 1. Wildlife friendly fence modifications deployed on the bottom wire of multi-strand barbed wire fencing during 2012 - 2016 field trials. All bottom wire modifications were at 18" of height. The results indicate that smooth wire (A.), and clips/carabiners (B.), are recommended modifications; while the PVC pipe (i.e., goat bar) (C.) is not recommended.



FIGURE 2. - Wildlife friendly fence modifications deployed on the top wire of multi-strand barbed wire fencing during 2016 - 2018 field trials. These modifications included sage-grouse markers (A.), and PVC pipe (B.). These top wire modifications were placed at known crossing sites during the after periods of the field trials.

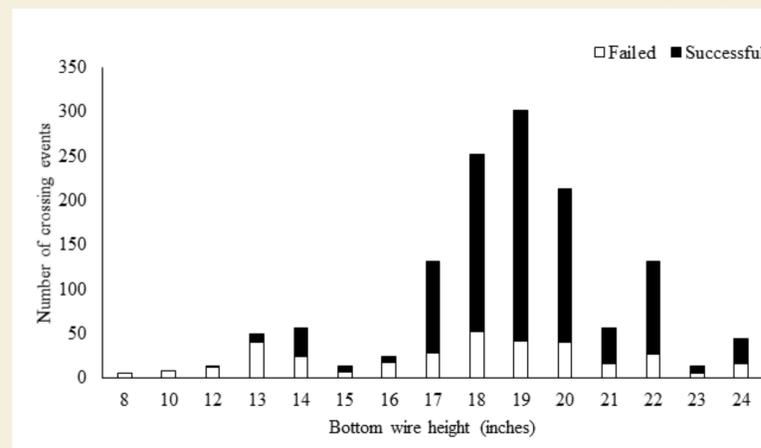


FIGURE 3. - Shows the effect of the bottom wire height on pronghorn crossing attempts at multi-strand barbed wire fences. These bottom wire heights and crossing numbers were measured prior to any fence modifications.

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BOTTOM WIRE FIELD TRIALS: 2012 - 2016

TOP WIRE FIELD TRIALS: 2016 - 2018

RESULTS: Pronghorn prefer fencing with a smooth bottom wire set at 18" or that have been modified with a clip/carabiner to create this bottom wire height and did NOT prefer PVC pipe 'goat bars' on the bottom wires to crawl underneath fencing. A minimum bottom wire height of 18" was found to be the single most contributing factor for successful pronghorn crossings (Fig. 3). In only one instance over a 5-year period and over 2 million images processed did any livestock (a calf) cross under a fence at a modified location. For the second experiment, we found that fences with PVC pipe and sage-grouse markers on the top wires do not affect the success of ungulate crossings. Instead, these modifications created a more visible fence and likely draw animals to the site of these modifications. Fence crossing locations and success depends on visualization, fence specs, and animal behavior.

RECOMENDATIONS: This research shows that a bottom wire height of 18" improves pronghorn and deer movements and has been proven effective at keeping cattle in intended pastures. A smooth bottom wire is preferred and results in fewer injuries during animal passage, but a barbed bottom wire at a height of 18" is acceptable when necessary for a successful negotiation. Clip/Carabiners can be used on existing fences to clip the bottom 2-wires together to achieve a bottom wire height of 18". Sage-grouse markers and PVC-pipes on top wires do not hamper movements and could be of value for wildlife visualization. We found wildlife crossing beneath fences by crawling more often than previously considered. We anticipate that these recommended fence modifications will provide 'win-win' opportunities for wildlife and landowners alike, when applied appropriately.

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